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(54) Apparatus for drying paint

(57) Paint drying apparatus, for example, for a vehicle body (1) comprises an overhead travelling gantry (10) with side pillars (13 and 14) and an overhead beam (16) the gantry carries overhead heating panels (15, 17, 18) and upright heating panels on the pillars (13 and 14). The apparatus has moving parts to enable the heating panels to approach to approximately 20cm of all surfaces of the vehicle body (1), and the gantry carries a sensor which upon an initial pass produces electrical signals representative of the shape of the vehicle body (1) and transmits them to a computer adapted, on a second pass, to place the heating panels progressively into close proximity with all surfaces of the vehicle body (1) thus to effect uniform heating and to ensure even drying of the paint on all surfaces. Considerable energy savings and improved drying performance are ensured by the accurate placement of the heating panels with respect to the surface profile of the vehicle body (1).

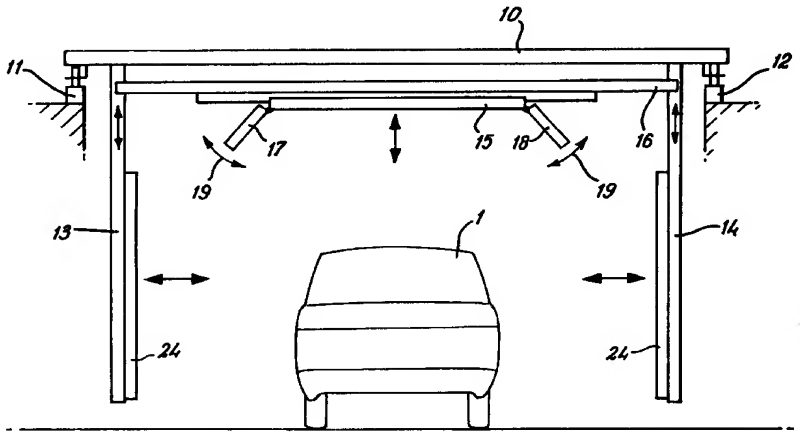

Fig.1

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Description

THIS INVENTION concerns apparatus for drying paint, particularly, though not exclusively on vehicle bodies. Conventionally, such apparatus consists of heating panels mounted on an overhead gantry with side pillars, the gantry being driven along a pair of tracks thus forming a travelling bridge which passes over the vehicle body or alternatively is mounted in a fixed position with the bodies passing beneath it. On such conventional apparatus the heating panels are usually fixed or have minimal adjustment so that the heating effect is not uniform over all parts of the surface of the vehicle body. This results in differential uneven drying and excessive consumption of heating energy. Consequently, the drying process is excessively time consuming and absorbs very large quantities of electrical energy, i.e. in the region of 60 kw. Accordingly, the high operating costs and physical limitations of the apparatus restrict its use to large industrial applications and to larger companies.

According to the present invention there is provided apparatus for drying paint comprising a supporting device on which is mounted at least one radiant heater, means to effect relative movement between the supporting device and an object to be dried, means for moving the heater with respect to the supporting device to locate the heater in an optimum drying position and at an optimum distance from the object, at least one sensor adapted to produce signals representative of the surface profile of the object, and control means responsive to signals from the sensor and adapted to cause movement of the heater into said optimum position.

Apparatus made in accordance with the invention preferably comprises several heating panels at least some of which are articulated and movable independently and selectively to allow a high degree of precision in the effective operation of the apparatus. Variations of movement of the heating panels are achieved by means of a strategically mounted sensor which effectively scans the profile of each object to be dried, and produces signals which are fed to a computer programmed to memorise and establish a record of the profile and subsequently to effect movement of the heating panels progressively thus to achieve uniform and cost-effective heating of the surfaces of the object whereby to minimise heat energy and reduce the time taken to dry an object completely and evenly.

As will be described, the apparatus consists essentially of an overhead gantry with side pillars adapted to travel linearly along a pair of spaced parallel tracks and carrying an overhead horizontal heating panel, and a pair of vertically disposed heating panels, the whole device being adapted to travel over a vehicle body to be dried. The overhead heating panel is adapted to be rotated about at least one horizontal axis and the vertical heating panels are movable towards and away from one another thus closely to approach the upright surfaces of the object to the dried.

An ultrasonic sensor is attached to the gantry which initially makes a pass over the object to be dried and produces signals which are fed into a computer memory thus to establish a record of the exact shape of the object. Software then determines appropriate movements of the respective heating panels to enable them to be placed progressively in face-to-face relationship with the various surfaces of the vehicle body within 30cm and preferably about 20cm from such surfaces.

An embodiment of the invention will now be described, by way of example only with reference to the accompanying drawings, in which:-

Fig. 1 is schematic representation of apparatus made in accordance with the invention;

Fig. 2 is a detailed vertical elevation thereof;

Fig. 3 is an end view taken in the direction A in Fig. 2;

Fig. 4 is a horizontal section taken along line IV-IV of Fig. 2;
and

Fig. 5 is an exploded illustration of the construction of a heating panel.

Referring now to the drawings the apparatus comprises an overhead gantry 10 supported on and extending horizontally between a pair of linear rails 11 and 12, and housing a pair of vertical pillars 13 and 14. The entire apparatus is adapted to travel along the rails 11 and 12 thus to pass over an object 1 such as a painted vehicle body to dry the paint. If required, vehicle bodies may be transported sequentially at a different speed beneath the gantry but may otherwise be stationary.

The object of the apparatus is to dry paint on the vehicle body as uniformly and as rapidly as possible with minimum utilisation of heating energy. As described previously conventional apparatus of this kind merely comprises vertical and horizontal heating panels which are in fixed disposition at considerable and uneven distances from the vehicle body and require excessive heat energy to ensure adequate drying of all parts thereof.

As indicated in Fig. 1, in accordance with the invention, a central overhead heating panel 15 is mounted on a cross beam 16 to be disposed generally horizontally and has a pair of end panels 17 and 18 which may pivot downwardly as shown by arrows 19, out of alignment with the panel 15. The entire assembly of heating panels 15, 17, 18 may be raised and lowered on beam 16 and manoeuvred about a generally horizontal axis thus to bring them downwardly to face leading or trailing surfaces of the vehicle body 1.

Similarly, the vertical pillars 13 and 14 with heating

panels 24 may be moved inwardly and outwardly to locate them at an optimum distance with respect to upright side surfaces on the vehicle body 1.

Referring now to Figs. 2 to 4, the vertical pillars 13 and 14 are mounted on carriages 26 and 27 movable along a horizontal beam 28 and the horizontal beam 16 carrying heating panels 15, 17 and 18 is mounted between a pair of carriages 29 which may move vertically with respect to the pillars 13 and 14. The beam 16 is telescopically extendible to accommodate movement of the pillars 13 and 14 towards and away from one another whilst maintaining support for the heating panels 15, 17, 18.

Fig. 3 illustrates a mechanism generally shown at 30 mounted on the carriage 29, which permits the heating panels 15, 17, and 18 to be pivoted about a pair of generally horizontal axes thus to bring them down to positions in which they may face forwardly or rearwardly of the apparatus thus to heat the leading or trailing vertical surfaces of the vehicle body.

Fig. 4 shows a scissor link assembly 31 which maintains the mechanism 30 in its correct operating position irrespective of movements inwardly or outwardly of the vertical pillars. Fig. 4 also shows a rectangular framework 32 which supports the horizontal heating panels 15, 17 and 18 on beam 16.

As shown in Fig. 5, each heating panel is of laminar form and consists of an outer cover 40, a fibreglass heat insulation sheet 41, non-inflammable sheet 42, a stainless steel sheet 43 of 0.5mm thickness, an electrical insulation sheet 44 of 0.5mm thickness, a 4 kw electrical element 45, a further electrical insulation sheet 46, an aluminium sheet 47 of 2.0mm thickness, and a box-like frame 48 with centering springs 49.

The effect of the panel which conveniently is approximately 1 metre square, is that substantially uniform infra-red radiant heat is given off by the aluminium sheet 47 heated by the element 45, throughout its area. The working temperature is in the region of 250°-300°C.

It will therefore be seen that the heating panels are adapted individually and collectively to be located as closely as possible and in direct face-to-face relationship with the various different surfaces of a vehicle body to be dried. By appropriate articulation and movement of the heating panels they can therefore be located progressively in positions which place them approximately 20cm from a particular surface to be dried, thus maximising the heating effect thereof and ensuring uniform drying.

As discussed previously, the entire apparatus conveniently traverses the vehicle body through one pass initially and an ultrasonic sensor (not shown) mounted thereon produces signals advising the computer memory of the exact shape and configuration of the vehicle body to be dried. This information is then processed by the computer and the various movable parts of the apparatus are actuated during a second pass over the vehicle body to place the heating panels progressively in face-to-face parallel relationship with the surfaces to be dried.

Thus, for example, as the apparatus approaches the vehicle body, the overhead panels will be moved downwardly and swivelled inwardly to a position within 20cm of, for example, the front of the vehicle body. During subsequent progression of the apparatus this panel will once again be raised and the side panels will be brought into within 20cm of the vertical sides of the vehicle body whilst the overhead heating panel will be brought down to such close proximity with the bonnet and then the roof thereof, subsequently following the upper and side profiles and finally being brought into position against the rear of the body.

By ensuring that the panels are located so closely to the surfaces to be dried this enables the amount of heat energy required to be significantly reduced when compared with conventional apparatus, i.e. to around 10 or 12 kw of electrical consumption.

Furthermore, the drying process is conducted more rapidly and uniformly.

The considerable cost saving in operation of such a machine renders it more readily usable by smaller organisations who, previously, would have needed to sub-contract their paint drying operations.

The heating panels may be radiant electrical or radiant flame gas/oil fired burners.

Claims

1. Paint drying apparatus comprising a supporting device on which is mounted at least one radiant heater, means to effect relative movement between the supporting device and an object to be dried, means for moving the heater with respect to the supporting device to locate the heater in an optimum drying position and at an optimum distance from the object, at least one sensor adapted to produce signals representative of the surface profile of the object, and control means responsive to the signals from the sensor and adapted to cause movement of the heater into said optimum position.

2. Paint drying apparatus according to Claim 1, comprising a plurality of heating panels movable independently and selectively with respect to the supporting device.

3. Paint drying apparatus according to Claim 1, wherein the control means comprises a computer programmed, upon receipt of said signals, to establish and memorise a record of the surface profile of the object to be dried and to effect movement of the heater progressively thus to locate same in close face-to-face relationship with the surface of the object to be dried.

4. Paint drying apparatus according to Claim 1, com-

prising an overhead gantry with side pillars adapted to travel linearly along a pair of spaced parallel tracks over the object to be dried and carrying an overhead horizontal heating panel and a pair of vertically disposed side heating panels.

5. Paint drying apparatus according to Claim 4, wherein the overhead horizontal heating panel has a pair of pivotally mounted end heating panels.

6. Paint drying apparatus according to Claim 4, wherein the overhead horizontal heating panel is adapted to be rotated about at least one horizontal axis thus closely to approach front, overhead and rear surfaces of the object to be dried, and the vertically disposed heating panels are movable towards and away from one another thus closely to approach the upright surfaces of the object to be dried.

7. Paint drying apparatus according to Claim 4, wherein the sensor is an ultrasonic sensor attached to the overhead gantry which is adapted initially to make a pass over the object to be dried whereby signals from the ultrasonic sensor, representative of the surface profile of the object to be dried may be fed into a computer memory to establish a record of the shape of the object, the computer containing software capable of determining appropriate movements of the heating panels to enable them closely to follow the surface profile of the object to be dried and within 30cm of said surface.

8. Paint drying apparatus according to Claim 7, wherein the software enables the heating panels to be as close as 20cm from the surface of the object to be dried.

9. Paint drying apparatus according to Claim 4, wherein the overhead horizontal heating panel is mounted on a telescopically extendible beam thus to accommodate movements of the vertically disposed heating panels towards and away from one another.

10. Paint drying apparatus according to Claim 4, wherein the overhead horizontal heating panel is mounted on carriages movable vertically on and with respect to the side pillars thus to enable the overhead horizontal heating panel to be raised and lowered.

11. Paint drying apparatus according to any preceding claim, wherein the or each radiant heater is of laminar form and comprises an electrical element having on opposite faces thereof an electrical insulation sheet and on one a metallic alloy sheet adapted to emit substantially uniform infra-red radiant heat with a working temperature in the region of 250°C to 300°C and to consume between 10 and 12 kw of electrical energy.

12. Paint drying apparatus according to any of claims 1 to 10, wherein the or each heater includes radiant flame burners.

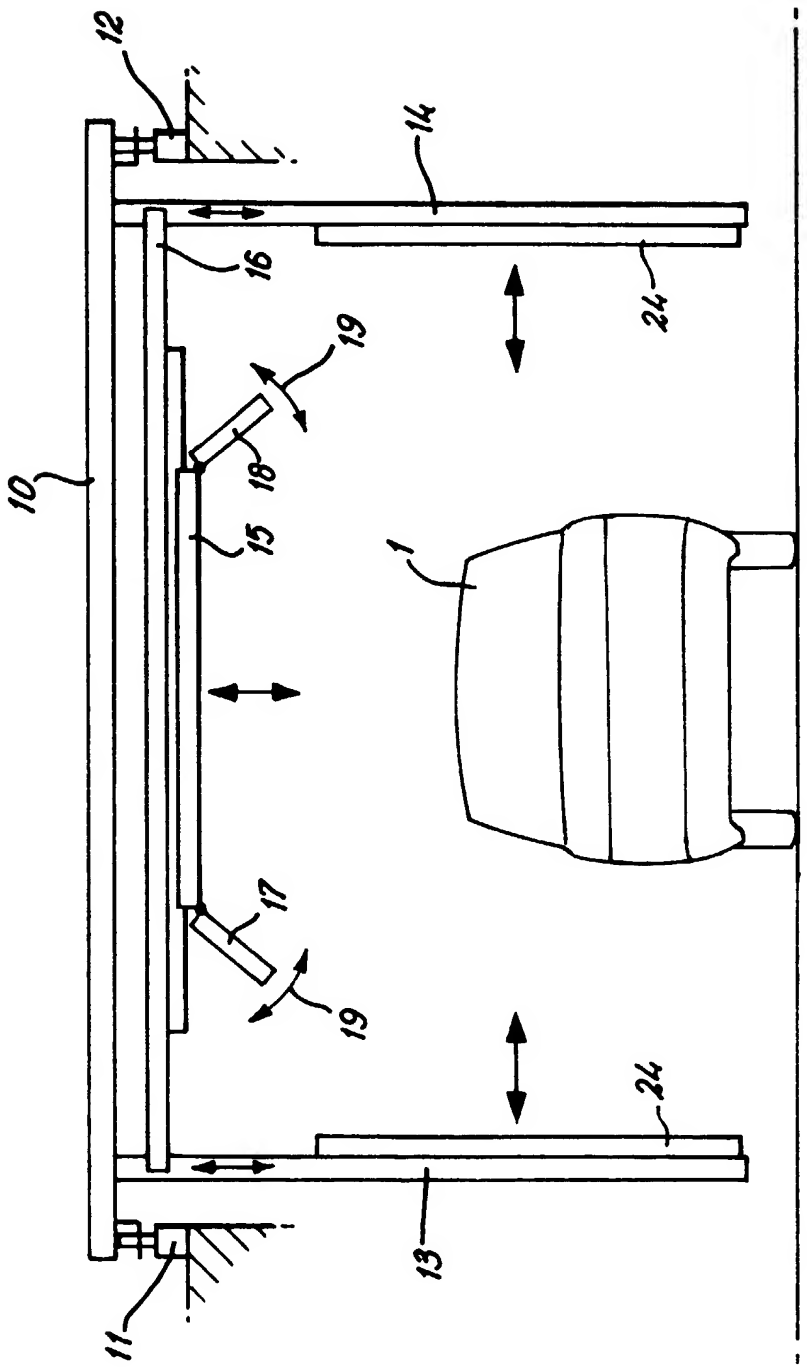

Fig.1

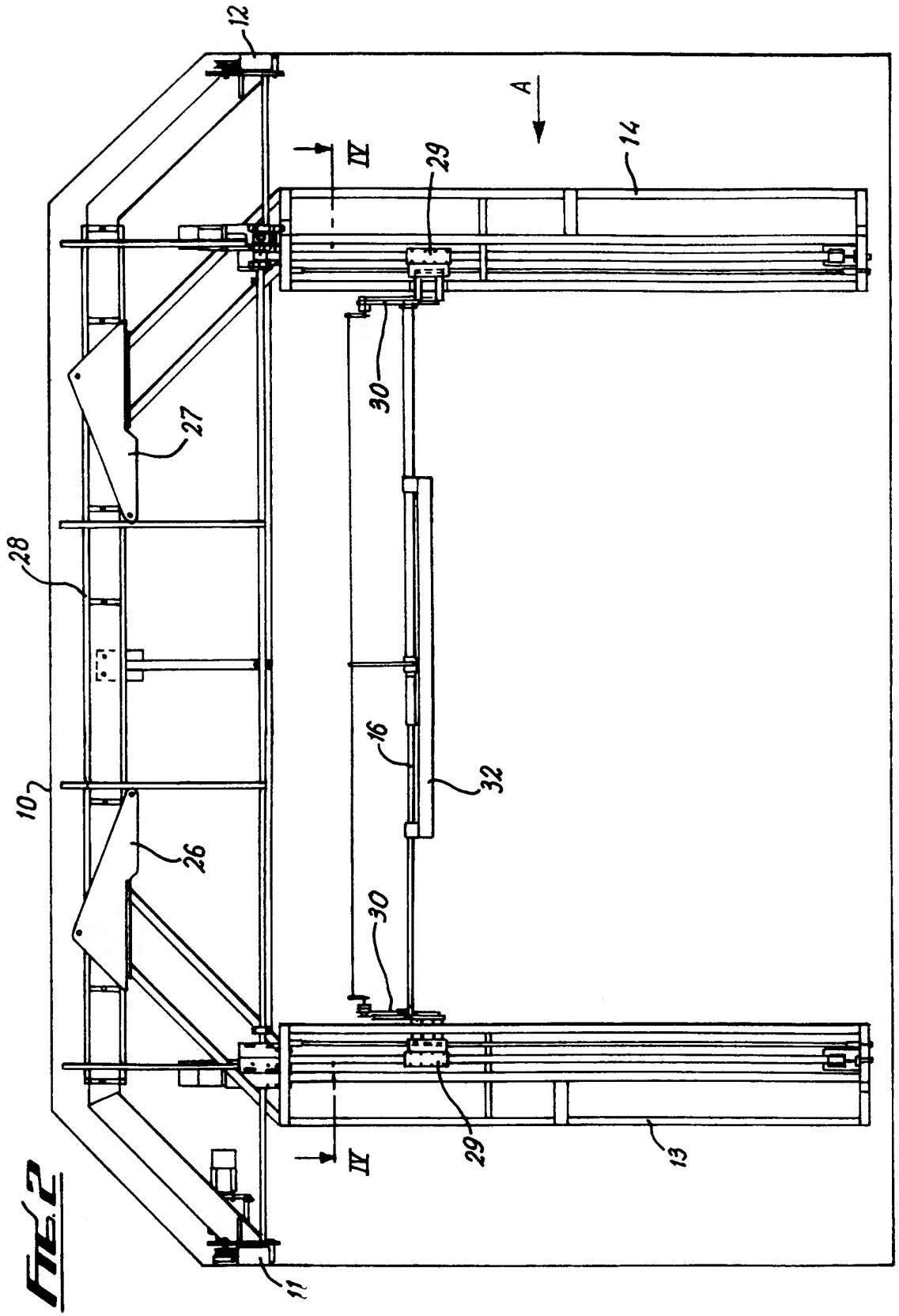

Fig.2

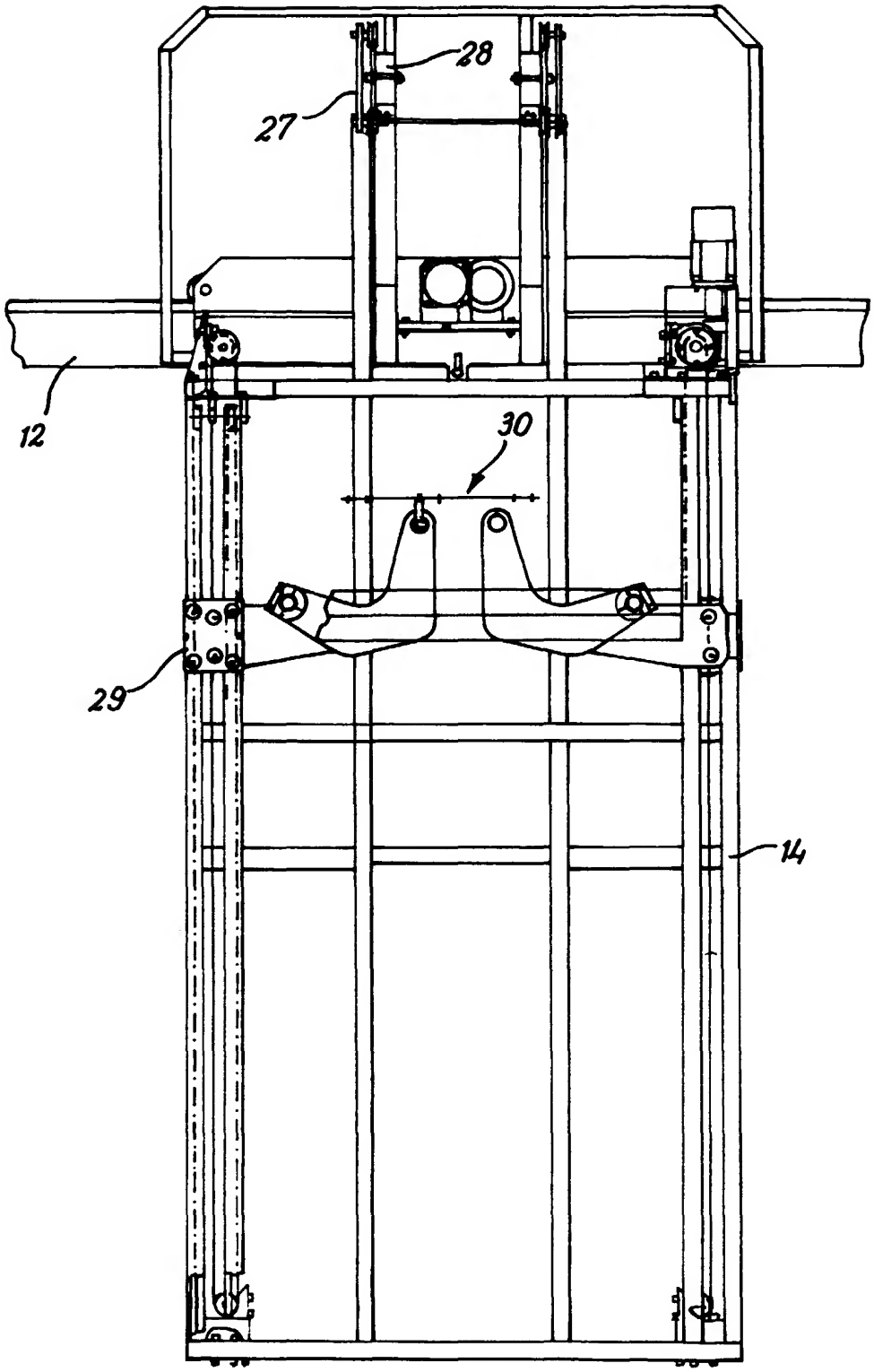

FIG. 3

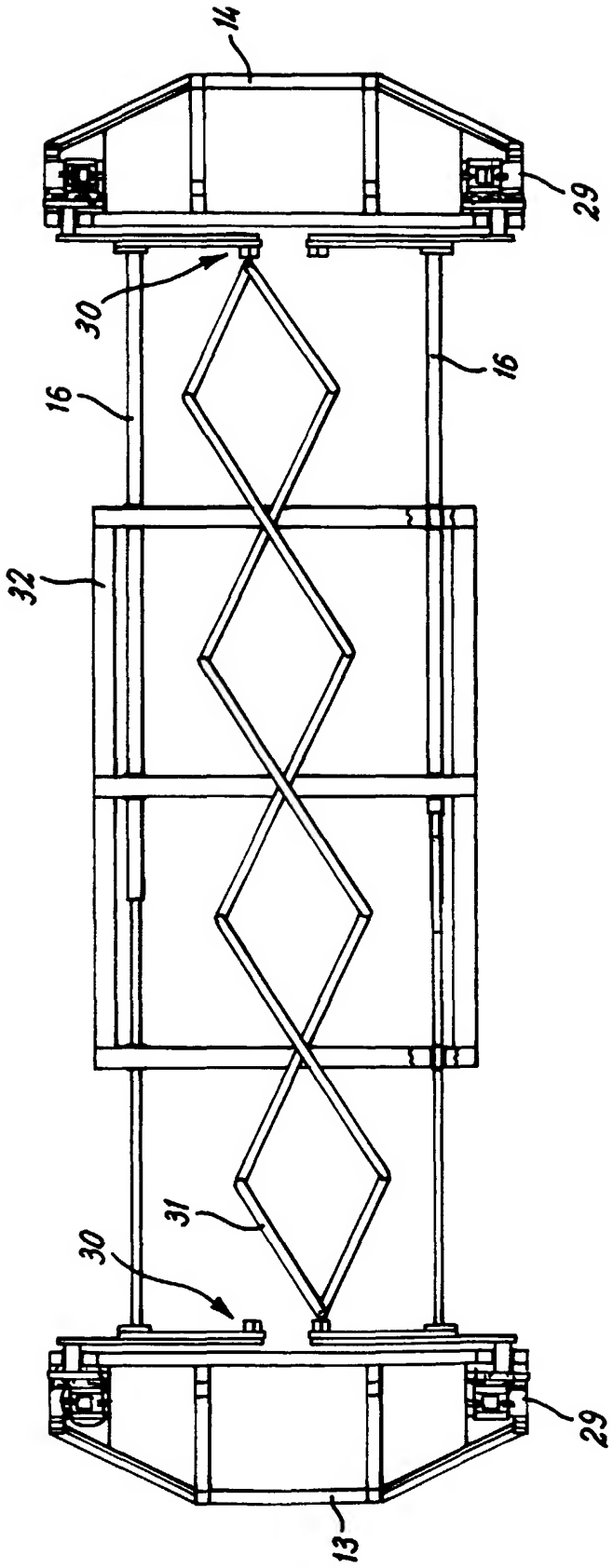

Fig.4

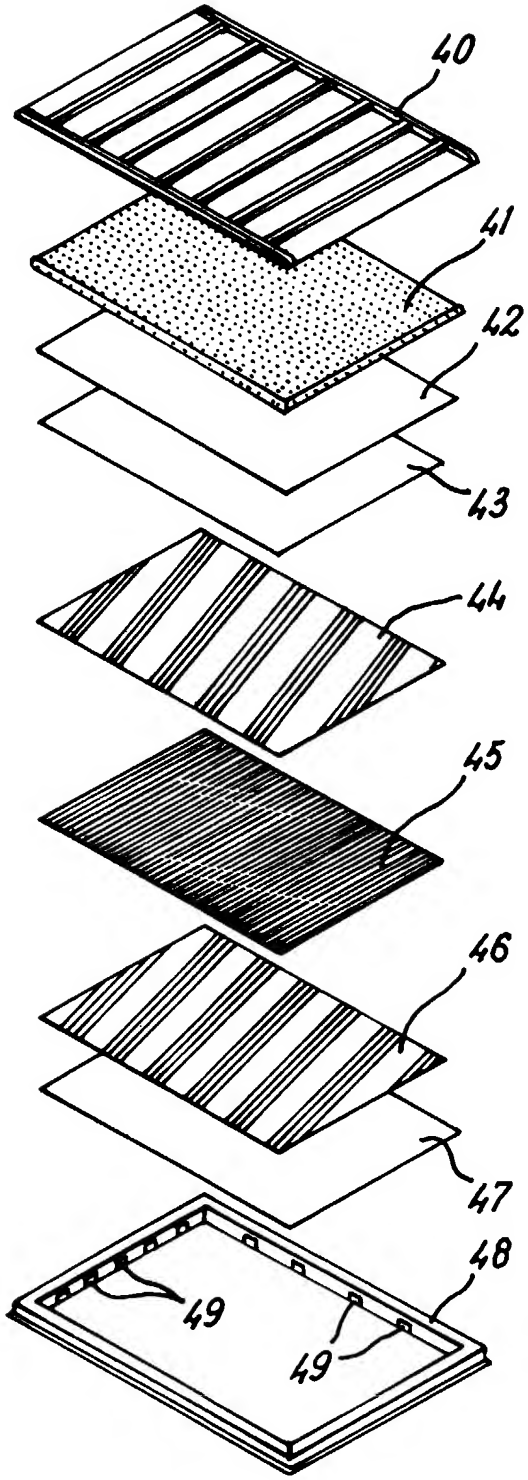

FIG. 5